Welcome to DialogClassic Web(tm)

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 Dialog level 00.12.12D
Last logoff:  20apr01 17:05:15
Logon file405 22apr01 09:16:55
          *** ANNOUNCEMENT ***
                   ***
NEW FILE RELEASED
***IBISWorld Market Research (File 753)
***Investext PDF Index (File 745)
***Daily and Sunday Telegraph (London) Papers (File 756)
***The Mirror Group Publications (United Kingdom) (File 757)
***Reuters Business Insight (File 759)

UPDATING RESUMED
***Extel Financial Cards from Primark (File 500)
***Books In Print (File 470)
***Extel News Cards from Primark (File 501)
                          ***
RELOADED
***Kompass Asia/Pacific (File 592)
***Kompass Central/Eastern Europe (File 593)
***Kompass Canada (File 594)

FILES REMOVED
***EconBase (File 565)

                    *** DIALOG HOMEBASE(SM) Main Menu ***

 Information:
  1.  Announcements (new files, reloads, etc.)
  2.  Database, Rates, & Command Descriptions
  3.  Help in Choosing Databases for Your Topic
  4.  Customer Services (telephone assistance, training, seminars, etc.)
  5.  Product Descriptions

 Connections:
  6.  DIALOG(R) Document Delivery
  7.  Data Star(R)

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      /H = Help           /L = Logoff          /NOMENU = Command Mode


Enter an option number to view information or to connect to an online
 service.  Enter a BEGIN command plus a file number to search a database
(e.g., B1 for ERIC).
?

 B 154,431,442,77,266,444
       22apr01 09:17:31 User264656 Session D9.1
            $0.00    0.386 DialUnits FileHomeBase
     $0.00  Estimated cost FileHomeBase
     $0.12  INTERNET
     $0.12  Estimated cost this search
     $0.12  Estimated total session cost   0.386 DialUnits

SYSTEM:OS  - DIALOG OneSearch
  File 154:MEDLINE(R)  1993-2001/May W2
         (c) format only 2000 Dialog Corporation
 *File 154: Medline has now updated. For further information
see Help News154.
  File 431:MediConf: Medical Con. & Events  1998-2001/Apr B1
         (c) 2001 Dr. R. Steck
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***File 431: There is no data missing. UDs have been adjusted to reflect** the current months data.
File 442:AMA Journals 1982-2000/Nov B2
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***File 442: There is no data missing. UDs have been adjusted to reflect** the current months data. See Help News442 for details.
File 77:Conference Papers Index 1973-2001/Mar
(c) 2001 Cambridge Sci Abs
File 266:FEDRIP 2001/Apr
Comp & dist by NTIS, Intl Copyright All Rights Res
File 444:New England Journal of Med. 1985-2001/Apr W4
(c) 2001 Mass. Med. Soc.
***File 444: UDs have been adjusted to reflect the current months data.** There is no data missing.

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      Set  Items  Description
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S AVERILL AND CLASSIFICATION AND RISK AND SEVERITY

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             56  AVERILL
         117017  CLASSIFICATION
         319024  RISK
          83648  SEVERITY
      S1     10  AVERILL AND CLASSIFICATION AND RISK AND SEVERITY
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TYPE S1/3,K/1-10

>>>KWIC option is not available in file(s): 77

1/3,K/1 (Item 1 from file: 442)
DIALOG(R)File 442:AMA Journals
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00115041
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Sustaining the Implementation of an Evidence-Based Guideline for Bronchiolitis (ARTICLE)

PERLSTEIN, PAUL H.; KOTAGAL, UMA R.; SCHOETTKER, PAMELA J.; ATHERTON, HARRY D.; FARRELL, MICHAEL K.; GERHARDT, WENDY E.; ALFARO, MARY PAT
American Journal of Diseases of Children
Oct, 2000; Article: tzp1001
LINE COUNT: 00546

... 90% of the population in the single All Patient Refined Diagnosis Related Group (APR-DRG) classification of 096 that is common for patients with asthma or bronchiolitis.13/ There was no difference between different years of admission in this APR-DRG 096 predominance. Disease severity rating, based on number, type, and mix of comorbid diagnoses, was mildly ill for all...in the emergency department and diagnosed as having asthma.

Because of uncertainties about the true risk of misdiagnosing asthma as bronchiolitis in an individual patient, the guideline used in our study... SA. The distinction between cost and charges. Ann Intern Med. 1982;96:102-109.

13.
Averill R, Goldfield N, Steinbeck B, Muldoon J, Beaudry P. All

1/3,K/2 (Item 2 from file: 442)
DIALOG(R)File 442:AMA Journals
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00107874

Functional Impairment and Co-occurring Psychiatric Disorders in Medically Hospitalized Men (ARTICLE)

BOOTH, BRENDA M.; BLOW, FREDERIC C.; COOK, CYNTHIA A. LOVELAND
Archives of Internal Medicine
July 27,, 1998; Original: tzi1551
LINE COUNT: 00853

... indicates the importance of identification and treatment of co-occurring psychiatric disorders in this high- risk and clinically challenging group of patients. Arch Intern Med. 1998;158:1551-1559
... of the National Institute of Mental Health Epidemiologic Catchment Area (ECA) study demonstrated that the risk of having a recent psychiatric disorder was increased 41% by the presence of a chronic...

... disorders to functional impairment. We conducted these analyses controlling for patient sociodemographics, medical diagnosis, and severity of medical illness.
RESULTS
SAMPLE DESCRIPTION
One thousand seven male inpatients from the 3 VAMCs...

...marital status, and medical diagnostic group (Figure). Early exploratory analyses also included the measure of severity of illness, the maximum CSI score that had been completed on only a subset of subjects (n = 603) because of resource limitations. However, illness severity was not independently associated with any measures of functional status, other than Physical Functioning. Therefore...status, and medical diagnosis, and also for the remaining diagnostic groups (Table 4). As before, severity of medical illness was independently associated with only Physical Functioning, so the analyses were conducted... found only minimal correlations between the SF-36 subscales and our objective measure of illness severity , the maximum CSI (all Pearson r<0.1), suggesting that the acuteness of the medical...Med Care. 1988;26:724-735.

30.
Horn SD, Sharkey PD, Buckle JM, Backofen JE, Averill RF, Horn RA. The relationship between severity of illness and hospital length of stay and mortality. Med Care. 1991;29:305-317.

31.
US Dept of Health and Human Services. The International Classification of Diseases, Ninth Revision, Clinical Modification. Washington, DC: US Government Printing Office; 1980.

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Thomas JW, Ashcraft MLF. Measuring severity of illness: six severity systems and their ability to explain cost variations. Inquiry. 1991;28:39-55.

33.
Pedhazur... during the index hospitalization at the same time as the Q-DIS.

We measured illness severity to avoid confounding the decreased functioning for seriously medically ill patients with any impairment associated with the co-occurring psychiatric disorder. We used an independent assessment of medical illness severity , the Computerized Severity Index (CSI).30/ Using clinical data abstracted from medical records, the CSI provides an overall maximum severity score for each patient that is based on the severity of all existing disease states. Information in the medical record, including multiple International Classification of Diseases, Ninth Revision, Clinical Modification codes,31/ disease complications, and objective clinical findings such as laboratory values and symptoms are used to generate a severity score from 1 to 4.30/ The CSI presents several important advantages over other measures of disease severity , including score comparability among all

individual and combinations of medical diagnoses and improved prediction of ...

... was examined after adjusting for age, race (white or nonwhite), marital status, medical diagnosis, and severity of illness. First, we tested the associations of the separate SF-36 subscales with a...the effect of mood and substance abuse disorders and demographics, medical diagnosis, and medical illness severity .

1/3,K/3 (Item 3 from file: 442)
DIALOG(R)File 442:AMA Journals

00105480

The Risks of Risk Adjustment (ARTICLE)

IEZZONI, LISA I.
JAMA, The Journal of the American Medical Association
November 19, 1997; 19: tzj1600
LINE COUNT: 00813

The Risks of Risk Adjustment

Context.-- Risk adjustment is essential before comparing patient outcomes across hospitals. Hospital report cards around the country use different risk adjustment methods. Objectives.--To examine the history and current practices of risk adjusting hospital death rates and consider the implications for using risk -adjusted mortality comparisons to assess quality. Data Sources and Study Selection.--This article examines severity measures used in states and regions to produce comparisons of risk -adjusted hospital death rates. Detailed results are presented from a study comparing current commercial severity measures using a single database. It included adults admitted for acute myocardial infarction (n=11 ...

... 016), and stroke (n=9407). Logistic regressions within each condition predicted in-hospital death using severity scores. Odds ratios for in-hospital death were compared across pairs of severity measures. For each hospital, z scores compared actual and expected death rates. Results.--The severity measure called Disease Staging had the highest c statistic (which measures how well a severity measure discriminates between patients who lived and those who died) for acute myocardial infarction, 0...

... the measure, MedisGroups, had the highest for pneumonia, 0.85 and stroke, 0.87. Different severity measures predicted different probabilities of death for many patients. Severity measures frequently disagreed about which hospitals had particularly low or high z scores. Agreement in identifying low- and high-mortality hospitals between severity -adjusted and unadjusted death rates was often better than agreement between severity measures. Conclusions.-- Severity does not explain differences in death rates across hospitals. Different severity measures frequently produce different impressions about relative hospital performance. Severity -adjusted mortality rates alone are unlikely to isolate quality differences across hospitals. JAMA. 1997;278...
...adjustment for differences in patients' risks. Observers generally agree that some hospitals treat more higher- risk patients than others and that hospitals should not be penalized for accepting risky patients. In addition, without risk adjustment, hospitals with poor outcomes can argue, `But my patients are sicker.'

Despite this general consensus about the need for risk adjustment when comparing outcomes, as in publicly released hospital report cards,3/

the devil is in the details. Determining which risk factors to include and how to measure them generates controversy. Practical constraints present difficulties. While researchers have devised detailed risk adjustors,4,5/ these methods are often too expensive to apply in large-scale report card efforts for hospitals. Finally, what do risk -adjusted outcomes tell us?

This article reviews issues raised by risk adjustment for publicly comparing outcomes across providers. Because most outcomes-based report cards to date...

... death rates,6-17/ I concentrate on this scenario, but the general principles pertain to risk adjustment in other settings as well.

WHY RISK ADJUST?

Hospitals vary, sometimes widely, in their death rates. The rationale for risk adjustment is to remove one source of this variation, leaving residual differences to reflect quality...

... result from a complex mix of factors: patient outcomes equal effectiveness of treatments plus patient risk factors that affect response to treatment plus quality of care plus random chance.

Controlling for patient risk allows us to begin isolating quality differences. But ` risk adjustment' is a meaningless phrase without first answering the question: risk of what? Identical risk factors may have different relationships to different outcomes (ie, an attribute suggesting high risk of one outcome may indicate low risk of another outcome). For example, when refining diagnosis related groups (DRGs) to improve their sensitivity to severity for hospital payment, researchers found that medical patients dying within 2 days of admission had relatively low-cost hospitalizations.18/ A risk adjustor that predicts one outcome (eg, death) may not predict another outcome (eg, costs).

Many...

... risks, including age, sex, acute physiological stability, principal diagnosis (ie, reason for hospitalization) and its severity , the extent and complexity of comorbid illnesses, functional status, psychosocial and cultural factors, socioeconomic characteristics...

... Black patients21/ and uninsured patients22/ may receive lower-quality hospital care than others. When using risk -adjusted outcomes to evaluate quality, adjusting for race or payer could mask these important differences.

WHERE TO START?

Most report card efforts trade off detailed, clinical risk assessments for logistical feasibility and reasonable cost. In addition, designing a method from scratch is...

... to predict in-hospital mortality for comparing hospital outcomes (Table 1).23-41/ Often called severity measures, their evolution highlights the most important practical concern in widespread risk assessment--the data source.

Early Development of Severity Measures

Researchers began creating tools for systematic severity measurement in the 1970s, generally to address local concerns.42/ For instance, the measure called Computerized Severity Index (CSI) descends from efforts to help a specific hospital respond to state regulators' questions...

... Vincent physicians observed morning report of the medical residents, noting clinical parameters that drove residents' severity assessments.30,44/ These observations led to MedisGroups' initial list of key clinical findings (KCFs).

Medicare's adoption of DRG-based prospective payment in 1983 elevated severity concerns to national prominence.46/ While DRG categories initially were derived clinically, their developers made...

... patient demographic data; payer information; principal and other

diagnoses and procedures coded using the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM); admission source; and discharge disposition (eg...

... coding of diagnoses not supported by clinical documentation.48/ In addition, studies suggested that important risk factors, especially chronic illnesses, are undercoded.49-51/ Nonetheless, despite limited clinical information of questionable...

... important advantages of uniformity, widespread availability, and computer readability.

Recognizing these benefits, developers of some severity measures (eg, Disease Staging39,40/ and Patient Management Categories [PMCs] Severity Scale52/) translated their severity logic into ICD-9-CM codes and designed ...files to refine the specifications of their method.

Quality Concerns and the Next Generation of Severity Measures

Payment based on the DRG heightened concerns about quality of care, which included fears...

... caring for terminally ill patients. This early HCFA model had serious methodological flaws, including inadequate severity adjustment.54/

At the same time, leaders in several states and regions wanted proof about...

...Minneapolis, Minn, led by Walter McClure, who viewed clinically credible data as essential to valid risk adjustment. McClure argued, `There is no other way than to go in and abstract the clinical findings from the chart. Let's stop fooling ourselves that we can compare patient severity by claims.'55/ The `buy right' program contracted with MedisGroups, abstracting hundreds of KCFs from medical records to measure severity .

Building off the experience in Minneapolis, the state legislature in Pennsylvania adopted what became known...

... in 1986, largely at the urging of local businesses. Section 3 of Act 89 defined severity as `in any patient, the measurable degree of the potential for failure of one or...
...to develop and test refinements to their method.

Thus, in the late 1980s, initiatives to risk adjust hospital mortality rates often required clinical information from medical records for severity adjustment. In addition to the MedisGroups mandates in Pennsylvania, Iowa, and Colorado, other initiatives also concentrated on collecting clinical data for risk adjustment, including the Cleveland Health Quality Choice program,17/ a similar effort in St Louis, the Department of Veterans Affairs Surgical Risk Study,56/ and programs to evaluate coronary artery bypass graft (CABG) mortality in New York...

... England.35,36/ With growing clinical databases, empirical techniques could now be used to refine severity measures. In addition, with relatively little effort, different models could be derived empirically to predict...

... MedisGroups versions to predict in-hospital death or length of stay). This new generation of severity measures, therefore, appeared both scientifically rigorous and clinically credible.

Nevertheless, the costs of clinical data...

... that the cost was not worth the information benefit. Iowa chose a discharge abstract-based severity measure called All Patient Refined DRGs (APR-DRGs) for risk adjustment. Colorado's MedisGroups program, dissolved in 1995, was also replaced by APR-DRGs.57...

... 2 million annual price tag. In 1991, California's legislature mandated production of `home-grown' risk -adjusted outcome measures, using the state's existing discharge abstract database.16/ A similar experience...

... of the Medicare hospital mortality reports, citing the inadequacy of HCFA's discharge abstract-based risk -adjustment method, especially for inner-city public hospitals.7/ Questions about data quality forced California...

... accuracy, which found striking variations across hospitals in the validity and reliability of coding certain risk factors.13/ Variation in coding accuracy explained part of the differences between hospitals that were...

...hospital to 74% at a facility considered low mortality.13/

Thus, current initiatives to compare risk -adjusted outcomes across hospitals sort into 2 camps: those willing and those unwilling to pay...

... and thus, presumably, power to sway physicians) and the second arguing resource constraints.

HOW DO SEVERITY MEASURES COMPARE?

Choosing among severity measures is often daunting (Table 1), but selecting different approaches produces a patchwork quilt of Dayton Employer Coalition recently chose the vendor of the Disease Staging severity measure.58/ Given the differences across severity measures, might different measures give different results?

Despite their widespread use, role in report cards, and potential influence in competitive health care marketplaces, severity measures have received little external scrutiny. Most publications about specific severity methods come from developers, and statistical performance measures vary (Table 2).59-63/ Because patient...

... Few comparative studies have been performed,59-62/ and most report on versions of the severity measures that are now out-of-date (Table 2). Conducting comparative studies is hampered by...

... of a single database containing all data elements in the exact form required by different severity measures and the proprietary ownership of many measures.

Our research group has conducted the only extensive, external study of several commercial severity measures sold for comparing hospital mortality rates.64-73/ We studied over a dozen approaches...

... Logistic regressions were run within each condition to predict death using patient age, sex, and severity scores.64-71/ Separate models were produced for each severity measure, and their statistical performance was judged using the c statistic (which measures how well a severity measure discriminates between patients who lived and those who died, so that c=0.5 ...

...these z scores.

Predicting In-Hospital Death for Individual Patients

Statistical Performance.--Potential purchasers of severity measures often look first at the statistical performance of severity measures summarized by c and R2/ statistics. As shown in Table 3, our c and R2/ values were similar to others reported in the literature (Table 2), and no severity measure performed best across all conditions.64-71/ MedisGroups produced the highest c and R2...expensive than MedisGroups.

Comparisons of In-Hospital Mortality Predictions.--The next question was whether different severity measures predict different likelihoods of in-hospital death for the same patients? There are a...

... death68-71/; however, regardless of the approach, the answer to this question was yes: different severity measures rated many patients very differently. For the analysis presented here, odds ratios (ORs) of death calculated by each severity measure were compared (eg, the odds of dying predicted by MedisGroups was divided by the...

...DRGs disagreed on 60.7% of CABG patients.

Comparing Hospital Mortality Rates

Finding differences across severity measures at the level of individual patients led to the question: would judgments about whether hospitals look particularly good or bad differ using different severity measures for risk adjustment? The answer to this question is yes--sometimes.64-67/ As before, there are several different approaches to addressing this question. Here, severity -adjusted death rates were used the way report cards or health insurers may use the...

...scores, hospitals were identified at 2 extremes:

1. The best 10%: hospitals with the lowest severity -adjusted death rates (the lowest z scores). These hospitals could be designated as exemplar benchmarks for quality improvement initiatives.

2. The worst 10%: hospitals with the highest severity -adjusted death rates (the highest z scores). Insurers may choose not to contract with these institutions.

Table 5 shows how often pairs of severity measures agreed about which hospitals fell into the best and worst 10% and how hospital rankings based on z scores associated with `raw' mortality rates (unadjusted for age, sex, or severity) agree. The immediate impression is that severity measures often flagged different hospitals than unadjusted mortality rates, but different severity measures also frequently flagged different hospitals. No clear pattern emerged, which suggests that discharge abstract ...

...for stroke).

When disagreements occurred, hospitals ranked in the top or bottom 10% by one severity measure often appeared in the next decile (11% to 20% or 81% to 90%) ranked...

...Disease Staging had 266 pneumonia patients with 20 deaths.

Interestingly, agreement in flagging hospitals between severity -adjusted and unadjusted mortality rates was often better than agreement between pairs of severity measures.64-67/ For example, MedisGroups and Disease Staging agreed on only 3 of the...

... for AMI, while MedisGroups and unadjusted rankings agreed on 6 hospitals. Therefore, one set of severity -adjusted findings was not obviously better than another or than unadjusted rankings. For each pair of severity measures, k statistics were calculated based on whether individual hospitals were flagged as among the...

... greater than expected by chance.80/ The k values showed fair to excellent agreement among severity measures in flagging hospitals (Table 5; k values are not presented for CABG because the...

... suggest that individual hospitals could care greatly about which mortality rates are examined--unadjusted vs severity -adjusted rates--and about which severity measure is used. While severity measures agreed about flagging hospitals more often than chance, rankings for some hospitals differed dramatically across severity measures. A logical, albeit worrisome, conclusion is that wise hospitals should `shop around' for the severity measure that shows them to the best advantage, although this measure could vary by condition.

Choosing among different severity measures requires consideration of a variety of factors. Despite their statistical performance, compelling reasons argue for diagnosis coding.48/ Additionally, to draw meaningful conclusions about quality based on severity -adjusted death rates, one must adjust only for preexisting conditions but not those arising late...
... for dying patients--as a hospital response to discharge abstract-based report cards.

WHAT DO RISK -ADJUSTED HOSPITAL DEATH RATES MEAN?

Hospitals vary in their unadjusted death rates. According to our work and the findings of others,35,82,83/ severity fails to explain these differences fully. As shown in California, differences across hospitals in

accuracy of data can account partially for discrepancies in risk -adjusted death rates, using measures based on discharge abstracts.13/ The central question remains unresolved: does severity adjustment isolate that residual quantity, namely quality-of-care differences, across hospitals?54/ A definitive...

... expected death rates. Using clinically detailed severity4/ and quality measures, Kahn et al85/ found that risk -adjusted mortality rates were significantly related to explicit judgments about process of quality of care for 4 of 5 conditions studied. Using PMCs for risk adjustment, Thomas et al86/ found that hospital mortality performance was significantly related to quality of...

...rather than low-mortality outlier hospitals.31/

Other studies failed to find any relationship between risk -adjusted mortality rates and hospital quality. Using the same rigorous severity and quality measures as Kahn et al,85/ Park et al88/ found that hospitals flagged...

... calculated by the US Department of Veterans Affairs using discharge abstract-type data.89/

WHY RISK ADJUST?

Report cards comparing death rates across hospitals are unlikely to vanish. Nonetheless, uncertainty persists about what risk -adjusted hospital death rates really mean. In addition, research suggests that different risk adjustors can produce different judgments about a hospital's mortality performance.64-67/ No studies are available, or likely, to tell us which risk adjustor is best, especially for isolating quality differences. The initial question, therefore, returns: given these vagaries, why risk adjust? The major reason is that, however imperfect, there is no other way to begin...

... and other clinicians about using outcomes information to motivate quality improvement.

Another compelling reason to risk adjust is to avoid penalizing providers who treat high- risk patients. As report cards naming individual hospitals and physicians increasingly make the front pages of...
... evidence suggests that some physicians and hospitals turn away patients they view as especially high risk .90,91/ Ensuring clinically credible risk adjustment could guard against this. Most current severity measures, however, do not include all patient characteristics that increase risk , such as physical functional status, patients' preferences for care and outcomes, cultural factors, and socioeconomic characteristics.19/ Risk must be assessed within subpopulations of patients (eg, racial and ethnic minorities, medically indigent persons) without bias. Even with clinically derived risk adjustment, some hospitals, like the Cleveland Clinic, will argue that their patients are different.92/

Designing a clinically reasonable but logistically feasible risk adjustment method is challenging and demands trade-offs. In today's highly charged, competitive environment, criticisms of risk adjustment are inevitable and often appropriate. The accumulated evidence suggests that strong inferences about quality should not be made based on risk -adjusted mortality rates alone. However, the risk of not risk adjusting is that information--albeit imperfect--will be summarily dismissed. Opportunities will be lost for...

... Health Care Policy and Research, Rockville, Md, under grant No. RO1 HS06742.

The 4-year severity study could not have happened without the creativity, energy, and determination of Michael Shwartz, PhD...

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1/3,K/4 (Item 4 from file: 442)
DIALOG(R)File 442:AMA Journals

00100275

The Effect of Managed Care on ICU Length of Stay Implications for Medicare
(ARTICLE)

ANGUS, DEREK C.; LINDE-ZWIRBLE, WALTER T.; SIRIO, CARL A.; ROTONDI, ARMANDO J.; CHELLURI, LAKSHMIPATHI; NEWBOLD, RICHARD C., III; LAVE, JUDITH R.; PINSKY, MICHAEL R.
JAMA, The Journal of the American Medical Association
October 2, 1996; 13: tzj1075
LINE COUNT: 00701

... Retrospective analysis of the 1992 Massachusetts state hospital discharge database, using prospectively developed and validated risk -stratification models. Setting.--All nonfederal hospitals in Massachusetts. Subjects.--Of all adult hospitalizations where an...

... regression models were constructed using split-halves validation to adjust for differences in age, sex, severity of illness, diagnosis, discharge status, and payer. Separatemodels were constructed for those younger than 65...

... R/2/L/=0.89 for the validation set). Significant covariables affecting LOS included age, severity of principal illness, comorbidity, reason for admission, and discharge status (P<.001 for each). Among...

...12.1% in patients aged <greater than or equal to>65 years [P<.05]). Age, severity of principal diagnosis, comorbidity, and reason for admission significantly influenced mortality (P<.001). After controlling...
... for ICU resource consumption, is not reduced under managed care when adjusted for differences in severity of illness. Wealso explored whether insurance status was predictive of hospital mortality and whether differences...

... sex, and ethnicity; diagnosis related group (DRG) assignment; up to 9 principal and secondary International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)/5/ diagnosis codes and 9 ICD...

...Medicare-sponsoredmanaged care plan.
Covariables included payer (as defined by groups 1-4), age, sex, severity of principal diagnosis, comorbidity, admission type (medical, elective surgical, or emergent/urgent surgical), and discharge...

... or equal to>75 years), and discharge status was recorded as alive or dead.
The severity of principal diagnosis was determined using Disease Staging (The MedStat Group, Ann Arbor, Mich). Disease...

... a software product developed by Gonnella et al/7/ to attribute levels, or stages, of severity to hospital discharge diagnoses. It was first reported in 1984 and has been extensively validated...
... of predefined, mutually exclusive stages of increasing body system involvement: stage 1, problems of minimal severity with no complications; stage 2, problems limited to an organor system with substantially increased risk of complications; and stage 3, generalized, multiple-site involvement and poor prognosis. Each stage is...the traditional insurance groups (1 and 3) with respect to demographic characteristics, clinical characteristics (including severity of illness and comorbidity), ICU LOS, and hospital mortality. Statistical significance was assessed using the... and the validation set (R/2/=0.83; R/2/L/=0.89) (Figure 2). Severity of principal diagnosis, comorbidity, admission type, and discharge status significantly influenced LOS in both age...

... and P=.13 when cross validated against the validation set). As with ICU LOS, age, severity of principal diagnosis, comorbidity, and admission type all significantly influenced the probability of death (P...

...52).

COMMENT

Our study of almost 90,000 ICU admissions demonstrates that, after adjusting for severity of illness, patients admitted to an ICU insured under managed care incur similar LOS when...in patients younger than 65 years, these differences were explained by differences in patient age, severity of illness, and comorbidity, and no benefit was seen with orwithout risk adjustment in the Medicare recipients.

The discrepancy between our findings and those of Rapoport et...

...choice of a linear rather than geometric model, incorporation of the DRG relative weight, and severity adjustment. The DRG assignment has been criticized previously as a case-mix adjustment measure because...

... in resource utilization unaccounted for by the DRG relative weight by including additional indicators of severity , but the distribution and weights of these variables resulted in little contribution to their model./36/ Remaining unobserved differences in severity may have correlated with payer, confounding their results./17/

The ICU LOS, though crude, has...

... admissions. However, if managed care organizations reduced ICU costs by avoiding the admission of low- severity patients, we would expect the severity of illness of managed care patients who were admitted to the ICU to be higher...

...acute or critical state. Braveman et al/51/ recentlyreported an analysis of appendectomy rates and risk of ruptured appendix in California. They found that patients managed under traditional insurance plans were... including cross-checking and auditing in order to reduce coding inconsistency./4/

Assigning disease and severity via discharge data has been criticized previously. However, though not comparable with admission severity systems such as Acute Physiology and Chronic Health Evaluation (APACHE) III or Mortality Probability Model II when used to predict risk for small groups and individuals, classification schemes such as Disease Staging compare well when used to adjust for severity across large populations./8,63-66/ Furthermore, much of the criticism arises when such data and severity systems are used to predict outcome such as mortality since certain codes predictive of death...

...example, for the small but significant mortality benefit of managed care where unobserved differences in severity may have been `carried' by payer. This would result in the false conclusion that hospitalization...

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1/3,K/5 (Item 5 from file: 442)
DIALOG(R)File 442:AMA Journals

00091970

Development of Complications During Rehabilitation (ARTICLE)

SIEGLER, EUGENIA L.; STINEMAN, MARGARET G.; MAISLIN, GREG
Archives of Internal Medicine
Oct 10,, 1994; Original: im_2185
LINE COUNT: 00325

... rehabilitation patients have many complications that warrant attention, none has attempted to categorize complications by severity . This retrospective cohort study examined the incidence, types, and severity of problems that interrupt rehabilitation and themajor risk factors for these events. Results: Of 1075 patients, 359 (33.4%) had acute medical complications...

... or fever(17.1%) and by thromboembolic events (16.5%). Logistic regression revealed that major risk factors for complications requiring transferwere a primary diagnosis of deconditioning or nontraumatic spinal

cord injury (adjusted odds ratio, 2.7; confidence interval, 1.8 to 4.2), severity of initial disability (adjusted odds ratio, 1.2; confidence interval, 1.1 to 1.3...

... of comorbid conditions (adjusted odds ratio, 1.1; confidence interval, 1.0 to 1.2). Risk factors for any complication were similar, but there was an interaction between comorbidity and the...

...were severely functionally impaired, the number of comorbidities was not as strongly associated with the risk of complications as it was in patients who were less functionally impaired. Conclusion: There is a complex relationship among the type of underlying medical impairment, severity of functional limitation, comorbidity, and unanticipated medical or surgical complications thatinterrupt rehabilitation. The interruptions vary both in type and in severity . (Arch Intern Med. 1994;154:2185-2190) Felsenthal et al/2/ and Parry,/3/ in preliminary studies, characterized the quantity and severity of medical diagnoses in rehabilitation patients. Unfortunately, these studies were small, andthey failed to distinguish...

... pulmonary embolus. One thousand seventy-five patients had sufficient data for multivariable analysis of the risk factors associated with complications. Three hundred fifty-nine had complications and 158 of those individuals...
... for each variable along with 95% confidence intervals. Male gender appeared to confer an increased risk for complications at the unadjusted level. Age, race, and previous living arrangement did not appear...

... 3 displays information about the relationship between functional status as measured by the MBI and risk of complications. For complications as a whole and the subset of unexpected transfers, the worse the functional status of the patient at admission, the greater the risk for an event.
Table 3 also demonstrates a relationship between number of comorbidities and risk of an event. Patients had on average 1.8 comorbidities. The risk of complications increased most sharply in the group of patients in the highest comorbidity category...

... complications, further analysis could not be performed. Logistic regression was then used to examine the risk factors for development of all complications or complications requiring transfer off rehabilitation. Table 5 lists the risk factorsthat remained statistically significant for all medical or surgical complications during rehabilitation. Male gender remained significant. Those admitted for nontraumatic SCI or deconditioning were also at increased risk .
There was a statistically significant interaction between MBI and the number of comorbid conditions for...
... person (Table 5). This is presumably because those with few chronic illnesses are at lower risk for any complication so that the role of initial function is increased.
The interaction may...

... functionally impaired (with low MBIs), the number of comorbidities was not significantly associated with the risk of complications. Only in those patients who were functioning at a higher level did the number of comorbidities appear to play a role asa risk factor. For example, given an MBI value of 20, each additionalcomorbidity added no additional risk (odds ratio, 1.0 0.8 to 1.2). If the value of the MBI...

...shows the results of the logistic regression for complications requiring transfer. As for the broader classification of any complication, the presence of nontraumatic SCI or deconditioning was a significant risk factor. Functional status was also significant, with a 1.2-fold increase in risk (95% confidence interval, 1.1 to 1.3) for each 10-point decline in MBI...

... database to determine what kinds of complications develop during

rehabilitation and who is at most risk for developing them. Most rehabilitation patients have medical problems that need evaluation and management. Felsenthal...

...and only 1% of patients had a life-threatening event.

In addition, categorizing complications by severity allowed determination of the roles of different kinds of complications. In this population, surgical complications and infections dominated overall, with cardiac and thromboembolic complications also playing alarge role.

Risk factors for the development of complications were few: ... status at the time of admission to the rehabilitation service was also related to the risk of complication. On the other hand, age was not associated with complication risk at the unadjustedor multivariate level. One might have anticipated that age would appear to be a major risk factor for complications, perhaps at the adjusted level or at least at the unadjusted level...

... This study builds on that relationship, demonstrating a clear association in a rehabilitation population between risk of complication, degree of functional impairment, and number of comorbidities. However, at least for the...

...of functional impairment.

Of note, Pompei et al/12/ have previously described an interaction between severity of illness and functional status, in their case, in the opposite direction of what our...

... and a much more severe outcome, one where a synergy between poor functional status and severity of illness would be anticipated. In fact, in our study, the interaction was no longer...

... the more severe medical complications (those requiring transfer) were included. In this latter case, the severity of functional impairment and the number of comorbid conditions were directly related to complication risk . Clearly, medical illness and function do interact with one another; the mechanism of that interaction...

...rehabilitation centers. In addition, the population wasa general medical rehabilitation population. In-depth investigation of risk factors for complications might be better served by focusing on a more uniform population--hip fracture or stroke patients, for example. Finally, only a few risk factors could be investigated, given the nature of the database; documenting underlying comorbidities of these...

...to more accurate predictions of who will develop complications.

Patients undergoing medical rehabilitation are at risk for complications at different levels of severity . Determining the natureof those complications and the risk factors for developing them can allow providers to intervene early and prevent significant morbidity and...

... decline. This study begins to tease apart the complex relationships between comorbidity, functional impairment, and risk ofmedical complications.

The reasons for unanticipated interruption of rehabilitation vary in both diagnosis and severity . Thus, (1) research should extend beyond cardiac and thromboembolic disease and continue to examine other types of complications; (2) future studies should take the severity of comorbidity into account; and (3) given the high frequency of complications in this setting...J ChronicDis. 1974;27:387-404.

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... Three definitions of complications were used. Those definitions were

hierarchical, and in increasing order of severity : (1) all complications--a group that included any event that unexpectedly interrupted, delayed, or prolonged...
... tested with quadratic equations to rule out nonlinear effects. Because the effects were linear, these risk factors were entered into the regression as continuous variables. The statistical software used was the ...

1/3,K/6 (Item 6 from file: 442)
DIALOG(R)File 442:AMA Journals

00005476

Staging of Disease; A Case-Mix Measurement (SPECIAL COMMUNICATIONS)

GONNELLA, JOSEPH S.; HORNBROOK, MARK C.; LOUIS, DANIEL Z.
JAMA, The Journal of the American Medical Association
February 3, 1984; 251: 637-644
LINE COUNT: 00543 WORD COUNT: 07503

ABSTRACT: Measurement of illness severity is required to evaluate diagnostic efficiency of physicians, assess quality of care, understand utilization of...

... trials, and reimburse hospitals on the basis of output. "Staging" is a method for measuring severity of specific, well-defined diseases. Staging defines discrete points in the course of individual diseases that are clinically detectable, reflect severity in terms of risk of death or residual impairment, and posses clinical significance for prognosis and choice of therapeutic...
... can be efficiently applied to computerized hospital discharge abstracts to derive a comprehensive case-mix classification system. Uses of staging in epidemiologic, case-mix, and utilization analyses are illustrated for diabetes...
DEVELOPMENT of scales measuring severity of diseases is a major challenge for the medical profession. Severity is defined here as the likelihood of death or residual impairment as the result of a disease, without consideration of treatment. Severity scales are useful in evaluating diagnostic efficiency of physicians, refining measures of prognosis, therapeutic effectiveness...

... based on the diagnoses of their patients' conditions. In the area of health care evaluation, severity scales enable more accurate measurement of health status before, during, and after medical intervention and...

... expected to be similar. However, there is no explicitmechanism in the DRGs to account for severity of illness within a particular diagnosis.
Many physicians and hospital administrators fear that their institutions...

... for municipal, teaching, and large referral hospitals. Indeed, to the extent that substantial variation in severity is observed within any DRG category and to the extent that severity is correlated with resource use, hospitals face an incentive to admit only the least severe...

... this potential problem by examining technically appropriate patterns of inpatient resource use by level of severity within each DRG category.
This article describes an approach to measuring disease severity , called "staging," that can be used to address this problem and many others. Disease staging...

... application to medical records and for automated application to

computerized hospital discharge abstract data. These severity criteria cover practically all admissions to the typical hospital so that staging represents a comprehensive case-mix classification sytem. It also provides a means of assessing appropriateness of admissions and discharges, of examining associations between medical resource use and severity of specific diseases, and of comparing hospital outputs on both a large-scale basis and...

... staging is described in this article, as well as the methods used to develop the severity criteria. Examples of potential applications of staging are presented, focusing on one disease, diabetes mellitus...

... done by physicians, hospitals, health agencies, or insurance companies.The problem is compounded by the classification systems used to store, retrieve, and analyze health data. Health problems (symptoms, physical abnormalities, and...
...disease: location of the problem, manifestations of the medical problem, cause of the problem, and severity of the problem. Each disease should be defined in terms of some specific organ or...

... did not know, even after study, or did not disclose what disease produced the CHF.
Severity of the pathophysiological changes must be given, when severity is defined as risk of death or temporary or permanent impairment. This can be done simply through specification of...to renal damage. Pneumococcal pneumonia with septicemia would be considered to be a different disease (severity) than pneumococcal pneumonia complicated by either empyema or meningitis.
May diagnostic labels traditionally used by medical professionals and most diagnostic rubrics in the various coding systems (eg, International Classification of Disease: Clinical Modification, ninth revision (Ref. 6)) do not give these types of data...

... case mix. Patients are classified into inappropriate groups for comparison of utilization patterns, and overall severity of disease for any group of patients cannot be assessed.

Disease Staging
A method called "staging" has been developed for measuring disease severity . (Ref. 7.) The concept behind staging is borrowed from clinical medicine, specifically oncology. During the...

...neoplastic diseases, there are discrete "stages" that can be defined and detected clinically, reflect the severity of the disease, and have clinical significance for prognosis and choice of therapeutic modality. This...

...all hospitalized patients.
In staging, diseases are generically divided into categories of increasing levels of severity : stage 1, conditions with no complications or problems of minimal severity ; stage 2, problems limited to an organ or system, significantly increased risk of complications over stage 1; stage 3, multiple site involvement, generalized systemic involvement, poor prognosis...

... does not depend on actual utilization patterns or on expected response to therapy to assess severity . It is based on a conceptual model of the disease process itself rather than on...

...from both heuristic and practical viewpoints, to include death as an end point of the severity scale. This provides explicit consideration of patients who die during the course of their treatments...

...discharge abstracts. These steps ensured that staging would be useful as a comprehensive case-mix classification system that could be applied to

large groups of patients.

Development of Medical Staging Criteria...

... primary category as deemed appropriate. Each substage should place the patient at a significantly higher risk of morbidity or mortality or both than the previous substage and should be clinically differentiable...

... other substages. When complications with each primary stage or substage cannot be differentiated in their severity , they should be classified as equivalent. Only single disease entities, without concern for complications arising...

... to translate each stage and substage definition into diagnostic codes, using the three primary disease classification systems: ICDA-8, (Ref. 8) H-ICDA-2, (Ref. 9) and ICD-9-CM. (Ref...and white blood cell and platelet counts. Again, the coded criteria tend to understate the severity of the disease in this situation.

An example set of medical and coded staging criteria...cases of a disease on average? How does utilization of health services vary with disease severity ?

Data

The data for the empirical analysis presented herein were derived from discharge abstracts of...

... and 3 are combined so as to simplify presentation and obtain higher frequencies in each severity level to facilitate further breakdowns by patient and hospital characteristics. Chi-square tests were performed... Patients listed as emergency admissions on the discharge abstract are more likely to have higher severity and die than regular admissions, thus providing a validity check on the staging criteria.

Fewer than one fifth of diabetes cases are operated on, but they have substantially higher severity levels, indicating an association between severity and resource use. This is also supported by a strong association between stage and number...

...on the abstract.

Finally, Medicare and self-paying patients are revealed to have significantly higher severity levels than other groups of patients. In the case of Medicare, this is likely to be age related. However, the higher severity of self-pay patients may be related to delay in seeking appropriate care, so that...

...provision of ambulatory care.

Case-Mix Analysis. -- A second application of staging is measurement of severity of hospitals' case mixes. By case mix, we mean the variety of different diseases being...

... mellitus by selected hospital characteristics are presented in Table 3. Again, some interesting associations with severity are found. Proprietary hospitals are shown to admit less severely ill diabetic patients as compared with voluntary and governmental hospitals. Strong associations between bed size and severity are observed.Medical school-affiliated hospitals tend to admit relatively more severe cases than nonaffiliated... however, to illustrate that there are significant case-mix differences among hospitals with respect to severity for this diagnosis.

Utilization Analysis. -- An important hypothesis regarding hospital utilization is that sicker patients...

... varies with selected patient and hospital characteristics within each stage. This enables the dimension of severity to be held constant while the impact of other factors on length of stay is...

...stages 3 and 4, which suggests that length of stay becomes more variable

with increased severity and also that economic factors may not be relevant at higher severity levels.

Length of stay breakdowns for diabetes by selected hospital characteristics are presented in Table...

... between patient groups, with respect to the nature of their illnesses, are maximized. Such a classification scheme, which must allow for the assessment of severity of disease, can then be used for studies of hospital utilization and costs, development of... care with respect to length of stay, surgery, and overall service intensity.The association between severity and resource use provides predictive validity of the staging criteria.

Considerable within-stage variation in resource use remains, much of which may be cause by factors other than biologic severity of illness. Patient-related factors, such as age, income level, expectations, health insurance coverage, family...

... historical data files must be interpreted with caution because high within-stage variation in actual severity levels may be present.

staging is relevant to the individual physician because it provides a tool for sharpening diagnostic classification . This will become particularly relevant in dealing with the impending regulations governing hospital admissions and...

... of this process will be greater requirements for documenting and justifying hospital admissions and discharges. Severity will play a crucial role here and staging can be used as an operational measure.

In contrast to other existing casetype classification system such as the DRGs, an important characteristic of the staging criteria is their emphasis...

... use principal operating room procedures to classify patients in different groups and ignore etiology and severity of the problem. For example, patients receiving a coronary bypass procedure are classified differently than...

... disease across institutions and physicians. Perhaps more important is that staging enables incorporation of disease severity into the prospective payment system.

CONCLUSIONS

The utility of the coded staging criteria and the...

... contribute to hospital costs or resource requirements. Indeed, it is specifically focused only on one -- severity of disease. Thus, staging should not be asked to provide a complete explanation of variation...

... was first seen, those developing during the hospitalization, and those successfully treated. Only by evaluating severity of patients' illnesses at various times can meaningful analyses of quality and cost-benefit tradeoffs...

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1/3,K/7 (Item 1 from file: 444)
DIALOG(R)File 444:New England Journal of Med.

00103919

Refining Case-Mix Adjustment: The Research Evidence (Special Article)

Jencks, Stephen F.; Dobson, Allen, Ph.D.
The New England Journal of Medicine
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LINE COUNT: 00643 WORD COUNT: 08881

...including outlier payments, in which payment accuracy might be improved without better measurement of the severity of illness. There is no available measure of severity of illness that would produce a large improvement in the accuracy of Medicare payments if...

...supplement or replace the system of diagnosis-related groups. Evidence regarding whether better measurement of severity would substantially change the distribution of payments across hospitals is mixed. Considerable evidence suggests that...

...for patients in the same diagnosis-related group varies substantially for reasons other than the severity of illness. Despite great demand for measures of the quality of care, important technical problems...

TEXT
...with payment issues such as teaching, wages, and hospital location; tools for measuring variations in severity of illness within diagnosis-related groups (DRGs); outliers -- i.e., cases that are so unusual...

...describe them very poorly; variations in the intensity of care for patients with a similar severity of illness; and whether case-mix adjustment permits inferences about the quality of care from...Variations in the severity of illness and the intensity of care within DRGs and differences in efficiency probably account...

...payment system is equitable; if this variation results from factors such as differences in the severity of illness within DRGs, for which Medicare should pay, then there is a problem. We...of substantial deliberate misreporting. The more serious concern regarding data quality is central to the `` severity '' problem: Medicare collects only the uniform hospital-discharge data set, which supplies no clinical information...

...Moskowitz (Ref. 14) have pointed out that diagnoses coded according to the current system (International Classification of Diseases, ninth revision, Clinical Modification) provide only a limited and ambiguous description of a...

...Variation in the Severity of Illness within DRGs
Variations in the clinical severity of illness among patients assigned to the same DRG result in differences in costs and outcomes. Measurements of severity that predict the cost of care may be quite different from measurements that predict outcomes...

...were developed by clinicians, with very little empirical input. A fully detailed description of the classification algorithm does not exist. Young, the developer of Patient Management Categories, believes that they should...

...be assigned to several categories. Neither system has a well-developed mechanism for assessing the severity of a case that is assigned to more than one category. The classification algorithms for both systems are largely in the public domain, but the computer software toThe Severity of Illness Index (Ref. 21) assigns a score from 1 to 4 that represents the overall severity of the patient's illness during the entire hospital stay. The overall score integrates seven...
...may now be of largely historic interest because she is focusing on developing the Computerized Severity Index. The new index uses discharge diagnoses to produce a list of physiologic data that...

...then integrates these elements in a diagnosis-specific way to produce an overall rating of severity within the DRG. This index is now being field-tested. The algorithm for the older...

...is scheduled for publication, but the computer software is proprietary. Horn has proposed using the severity index within DRGs to refine DRG payments...

...The acute physiology and chronic health evaluation (APACHE) system assigns a patient an overall severity score (ranging from 0 to 71) based on age, a few data on long-term...

...record. Patients are scored independently of diagnosis. Knaus and colleagues developed APACHE to predict the risk of death in intensive care units, and it has proved to be a strong predictor...

...Ref. 27) uses a special abstraction of physical examination and test data to assign a severity score (0 to 4) to the patient; for payment purposes and for predicting outcomes, this...

...200 possibly important items. The way in which the items are integrated to yield a severity score is not diagnosis-specific. The definitions of items and the algorithms for scoring are...

...First, to the extent that a severity measure confirms current beliefs that teaching hospitals, ``disproportionate-share'' hospitals, and urban hospitals have more...

...Second, although the severity of illness is clearly an important determinant of costs in individual cases, differences in severity may well average out at the hospital level. Horn et al. (Ref. 29,30) have argued that interhospital differences in severity account for a large part of the difference between hospital costs and prospective payments, but ...

...and work at HCFA (using DRGs revised by staging) have found that interhospital differences in severity beyond those measured by DRGs account for little of the observed interhospital differences in cost...

...Assessment Commission; the commission takes a fairly cautious view of the prospects for measures of severity (Ref. 32...

...costs, and to collect the data necessary to set payment weights for

various levels of severity . Experience suggests that 30 to 42 months would elapse from the time the project began...

...In summary, no single solution is in sight for adjusting payments for differences in severity within DRGs. Research suggests that we can make progress through innovations using currently available data...

...of medically appropriate care provided to patients in the same DRG who have a similar severity of illness. Distinguishing this medically appropriate variation from variations due to unnecessary, inefficient, or inadequate...

...care and the goals of care set an absolute limit on how well measures of severity can predict cost and, in many cases, on how well they can predict outcomes. On...

...pay for the former and discourage the latter.

Variations among Patients

Patients with a similar severity of illness and in the same DRG receive care that varies in intensity for a stays, whereas others are treated during a single, longer stay. For example, neither the severity of illness nor the nature of the illness fully predicts the amount of care that...

...variation in intensity of care among hospitals is likely to remain even after the best severity adjustments to DRGs, although better ways to describe the purpose of admission could reduce this...Using case-mix adjustment to measure the quality of care requires assuming or proving that risk -adjusted differences in outcomes result from differences in the quality of care. This hypothesis is...

... Severity adjustments that predict outcome are not identical to those that predict cost. Because every hospitalization... Risk -adjusted outcomes are perhaps best viewed today as screening tools that may suggest where problems...

...become an extremely active area of research with a strengthening quantitative base. The problem of severity of illness, widely used almost as a synonym for ``case-mix adjustment,'' is only part...

...refining Medicare's prospective payment system. It is ironic that as the scientific base regarding severity measurement for payment is growing, the public may press for application to the area of

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...Medicare. Health Care Financ Rev 1982; 3(3):41-73.
43. Fetter RB, Thompson JD, Averill RF, et al. The new ICD-9-CM diagnosis related groups (DRG) classification scheme: final report to

1/3,K/8 (Item 2 from file: 444)
DIALOG(R)File 444:New England Journal of Med.

00103595

Refining Case-Mix Adjustment: The Research Evidence (Special Article)

Jencks, Stephen F.; Dobson, Allen, Ph.D.
The New England Journal of Medicine
September 10, 1987; 317 (11),pp 679-686
LINE COUNT: 00643 WORD COUNT: 08881

...including outlier payments, in which payment accuracy might be improved without better measurement of the severity of illness. There is no available measure of severity of illness that would produce a large improvement in the accuracy of Medicare payments if...

...supplement or replace the system of diagnosis-related groups. Evidence regarding whether better measurement of severity would substantially change the distribution of payments across hospitals is mixed. Considerable evidence suggests that...

...for patients in the same diagnosis-related group varies substantially for reasons other than the severity of illness. Despite great demand for measures of the quality of care, important technical problems...

TEXT
...with payment issues such as teaching, wages, and hospital location; tools for measuring variations in severity of illness within diagnosis-related groups (DRGs); outliers -- i.e., cases that are so unusual...

...describe them very poorly; variations in the intensity of care for

patients with a similar severity of illness; and whether case-mix adjustment permits inferences about the quality of care from...Variations in the severity of illness and the intensity of care within DRGs and differences in efficiency probably account...

...payment system is equitable; if this variation results from factors such as differences in the severity of illness within DRGs, for which Medicare should pay, then there is a problem. We...of substantial deliberate misreporting. The more serious concern regarding data quality is central to the `` severity '' problem: Medicare collects only the uniform hospital-discharge data set, which supplies no clinical information...

...Moskowitz (Ref. 14) have pointed out that diagnoses coded according to the current system (International Classification of Diseases, ninth revision, Clinical Modification) provide only a limited and ambiguous description of a...

...Variation in the Severity of Illness within DRGs
Variations in the clinical severity of illness among patients assigned to the same DRG result in differences in costs and outcomes. Measurements of severity that predict the cost of care may be quite different from measurements that predict outcomes...

...were developed by clinicians, with very little empirical input. A fully detailed description of the classification algorithm does not exist. Young, the developer of Patient Management Categories, believes that they should...

...be assigned to several categories. Neither system has a well-developed mechanism for assessing the severity of a case that is assigned to more than one category. The classification algorithms for both systems are largely in the public domain, but the computer software toThe Severity of Illness Index (Ref. 21) assigns a score from 1 to 4 that represents the overall severity of the patient's illness during the entire hospital stay. The overall score integrates seven...
...may now be of largely historic interest because she is focusing on developing the Computerized Severity Index. The new index uses discharge diagnoses to produce a list of physiologic data that...

...then integrates these elements in a diagnosis-specific way to produce an overall rating of severity within the DRG. This index is now being field-tested. The algorithm for the older...

...is scheduled for publication, but the computer software is proprietary. Horn has proposed using the severity index within DRGs to refine DRG payments...

...The acute physiology and chronic health evaluation (APACHE) system assigns a patient an overall severity score (ranging from 0 to 71) based on age, a few data on long-term...

...record. Patients are scored independently of diagnosis. Knaus and colleagues developed APACHE to predict the risk of death in intensive care units, and it has proved to be a strong predictor...

...Ref. 27) uses a special abstraction of physical examination and test data to assign a severity score (0 to 4) to the patient; for payment purposes and for predicting outcomes, this...

...200 possibly important items. The way in which the items are integrated to yield a severity score is not diagnosis-specific. The definitions of items and the algorithms for scoring are...

...First, to the extent that a severity measure confirms current beliefs that teaching hospitals, ``disproportionate-share'' hospitals, and urban

hospitals have more...

...Second, although the severity of illness is clearly an important determinant of costs in individual cases, differences in severity may well average out at the hospital level. Horn et al. (Ref. 29,30) have argued that interhospital differences in severity account for a large part of the difference between hospital costs and prospective payments, but ...

...and work at HCFA (using DRGs revised by staging) have found that interhospital differences in severity beyond those measured by DRGs account for little of the observed interhospital differences in cost...

...Assessment Commission; the commission takes a fairly cautious view of the prospects for measures of severity (Ref. 32...

...costs, and to collect the data necessary to set payment weights for various levels of severity . Experience suggests that 30 to 42 months would elapse from the time the project began...

...In summary, no single solution is in sight for adjusting payments for differences in severity within DRGs. Research suggests that we can make progress through innovations using currently available data...

...of medically appropriate care provided to patients in the same DRG who have a similar severity of illness. Distinguishing this medically appropriate variation from variations due to unnecessary, inefficient, or inadequate...

...care and the goals of care set an absolute limit on how well measures of severity can predict cost and, in many cases, on how well they can predict outcomes. On...

...pay for the former and discourage the latter.

Variations among Patients

Patients with a similar severity of illness and in the same DRG receive care that varies in intensity for a stays, whereas others are treated during a single, longer stay. For example, neither the severity of illness nor the nature of the illness fully predicts the amount of care that...

...variation in intensity of care among hospitals is likely to remain even after the best severity adjustments to DRGs, although better ways to describe the purpose of admission could reduce this...Using case-mix adjustment to measure the quality of care requires assuming or proving that risk -adjusted differences in outcomes result from differences in the quality of care. This hypothesis is...

... Severity adjustments that predict outcome are not identical to those that predict cost. Because every hospitalization... Risk -adjusted outcomes are perhaps best viewed today as screening tools that may suggest where problems...

...become an extremely active area of research with a strengthening quantitative base. The problem of severity of illness, widely used almost as a synonym for ``case-mix adjustment,'' is only part...

...refining Medicare's prospective payment system. It is ironic that as the scientific base regarding severity measurement for payment is growing, the public may press for application to the area of

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...Health, University of Michigan, 1986.
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...bedsize. Waltham, Mass.: Brandeis University Health Policy Center, 1985.

39. Bowen OK. DRG refinement: outliers, severity of illness, and intensity of care: report to Congress. Washington, D.C.: Department of Health...

...Medicare. Health Care Financ Rev 1982; 3(3):41-73.
43. Fetter RB, Thompson JD, Averill RF, et al. The new ICD-9-CM diagnosis related groups (DRG) classification scheme: final report to

1/3,K/9 (Item 3 from file: 444)

DIALOG(R)File 444:New England Journal of Med.

00100269

The Indirect Costs of Graduate Medical Education (Special Article)

Cameron, James M., Ph.D.
The New England Journal of Medicine
May 9, 1985; 312 (19),pp 1233-1238
LINE COUNT: 00600 WORD COUNT: 08289

TEXT
...identifying transfer patients.
Assignment to Diagnosis-Related Groups
The original diagnosis-related group (DRG) patient- classification

scheme was used to account for differences in patient case mix (Ref. 19). All patient...its standard metropolitan statistical area to derive equalized direct and full costs for each hospital.
Classification of Teaching Hospitals
Instead of having teaching intensity defined through a simple head count of...
...least 10 residents in internal medicine and family practice combined. These criteria resulted in the classification of 15 hospitals as major teaching and 51 as minor teaching hospitals. Although based on a subjective set of criteria, this classification scheme was intended to account for both the depth and breadth of teaching intensity.
Measuring...nonteaching settings. It has been suggested that DRGs do not fully capture the differences in severity of case mix between teaching and nonteaching hospitals (Ref. 20). The question of whether another patient- classification scheme providing a more sensitive measure of severity offers a more appropriate mechanism for comparing costs among categories of teaching hospitals hinges on...

...date, this has not been established, in spite of the widespread belief that differences of severity within DRGs are important between teaching and nonteaching hospitals for high- risk DRGs. Insofar as our study included only Medi-Cal patients, a much smaller proportion of whom fall within high- risk DRGs than of Medicare patients, the effect of any such severity differences is likely to be less pronounced.
Implications
This study included only Medi-Cal acute...

CITED REFERENCES
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21. Whitcomb...

1/3,K/10 (Item 4 from file: 444)
DIALOG(R)File 444:New England Journal of Med.

00100006

Children with Very Low Birth Weights (Correspondence)

Robertson, Charlene M.T.; Sauve, Reginald S.; Etches, Philip C.; Hack, Maureen; Taylor, H. Gerry; Klein, Nancy.
The New England Journal of Medicine
Mar 9, 1995; 332 (10),pp 684-685
LINE COUNT: 00079 WORD COUNT: 01094

TEXT
...0.14 and 0.15 for Lake and Geauga counties to 0.29 and 0. 47 for Cuyahoga and Lorain counties, respectively...and the results of others (Ref. 5) have shown no differences in two-year neurodevelopmental outcomes after the use of surfactant

CITED REFERENCES
...RS, Christianson HE. Province-based study of neurologic disability among survivors weighing 500 through 1249 grams at birth. Pediatrics 1994;93:636-40.
Reference 005
5. Casiro O, Bingham E, MacMurray...

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S1          10   AVERILL AND CLASSIFICATION AND RISK AND SEVERITY
S2          17   RIMELL
?

 S AVERILL AND EISENHANDLER
              56  AVERILL
               2  EISENHANDLER
      S3       0  AVERILL AND EISENHANDLER
?

 S EISENHANDLER
      S4       2  EISENHANDLER
?

 TYPE S4/3,K/1-2
>>>KWIC option is not available in file(s): 77

  4/3,K/1     (Item 1 from file: 442)
DIALOG(R)File 442:AMA  Journals
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00083311
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 The Lifetime Cost of Treating a Person With HIV  (ARTICLE)

  HELLINGER, FRED J.
  JAMA, The Journal of the American Medical Association
  July 28, 1993; 4: p474
  LINE COUNT: 00478

... Office of Epidemiological Research, New York City Department of Health,
oral  communication,  December 12, 1991).  Eisenhandler /15/ forecasts that
patients  with  AIDS  covered  by Empire Blue Cross/Blue Shield who were...
1996.  Washington,  DC:  Agency for HIV/AIDS, Government of the District of
Columbia; 1992.
       15.   Eisenhandler   J. AIDS update. Presented before Blue Cross and
Blue Shield Association of America; September 21...


  4/3,K/2     (Item 2 from file: 442)
DIALOG(R)File 442:AMA  Journals
(c)2001 Amer Med Assn -FARS/DARS apply. All rts. reserv.

00082989
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 Opiate  Dependency  Among  the  Subscribers  of  a  New  York  Area Private
 Insurance Plan  (ARTICLE)

  EISENHANDLER, JON
  JAMA, The Journal of the American Medical Association
  June 9, 1993; 22: p2890
  LINE COUNT: 00198

... Setting: The Basis for Controlled Intoxicant Use. New Haven, Conn: Yale
University Press; 1984.
       7.   Eisenhandler   J. AIDS  update:  the  medical  costs  of  AIDS.
Presented at the Society of Actuaries Spring...

...of Drug Abuse; 1992.
     From Empire Blue Cross and Blue Shield, New York, NY (Dr  Eisenhandler
);  and  the  Department  of  Epidemiology  and Social Medicine, Montefiore
Medical Center, Albert Einstein College of...
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... to Empire Blue Cross and Blue Shield, 622 Third Ave, New York, NY 10017
(Dr  Eisenhandler ).
     TABLE OMITTED
     TABLE OMITTED
?

 S AVERILL
      S5      56  AVERILL
?

 S S5 AND SEVERITY(W)LEVEL
              56  S5
           83648  SEVERITY
          302324  LEVEL
             132  SEVERITY(W)LEVEL
      S6       1  S5 AND SEVERITY(W)LEVEL
?

 TYPE S6/3,K/1
>>>KWIC option is not available in file(s): 77

  6/3,K/1      (Item 1 from file: 442)
DIALOG(R)File 442:AMA  Journals
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00005476
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 Staging of Disease; A Case-Mix Measurement  (SPECIAL COMMUNICATIONS )

  GONNELLA, JOSEPH S.; HORNBROOK, MARK C.; LOUIS, DANIEL Z.
  JAMA, The Journal of the American Medical Association
  February 3, 1984; 251: 637-644
  LINE COUNT: 00543          WORD COUNT: 07503

... and  3  are  combined  so as to simplify presentation and obtain higher
frequencies  in each  severity  level  to facilitate further breakdowns by
patient and hospital characteristics. Chi-square tests were performed to...
 CITED REFERENCES:
  ...of hospitals. N Engl J Med 1983;308: 1428-1432.

  3. Fetter RB, Thompson JD,  Averill  RA, et al: The New ICD-9-CM
      Diagnosis Related Groups Classification Scheme: Users Manual...
?

 TYPE S6/FULL/1

  6/9/1      (Item 1 from file: 442)
DIALOG(R)File 442:AMA  Journals
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 Staging of Disease; A Case-Mix Measurement  (SPECIAL COMMUNICATIONS )

  GONNELLA, JOSEPH S.; HORNBROOK, MARK C.; LOUIS, DANIEL Z.
  JAMA, The Journal of the American Medical Association
  February 3, 1984; 251: 637-644
  LINE COUNT: 00543          WORD COUNT: 07503
  ISSN: 0098-7484
 CORPORATE  SOURCE:  From  the Center for Research in Medical Education and
Health  Care,  Jefferson  Medical  College, Philadelphia (Dr Gonnella); the
Division  of  Intramural  Research,  National  Center  for  Health Services
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Research, Department of Health and Human Services, Rockville, Md (Dr Hornbrook); and Syste-Metrics, Inc, Santa Barbara, Calif (Mr Louis). Dr Hornbrook is now with the Health Services Research Center, Kaiser-Permanente Medical Care Program, Portland, Ore. The views expressed in this article are those of the authors, and no official endorsement by the National Center for Health Services Research is intended or should be inferred. Reprint requests to Center for Research in Medical Education and Health Care, Jefferson Medical College, 1025 Walnut St, Philadelphia, PA 19107 (Dr Gonnella). Development and refinement of the staging criteria and software were supported by contract 233-78-3001 from the National Center for Health Services Research to SystemMetrics, Inc. The following medical professionals devoted considerable time and effort in formulating the medical staging criteria: Bernard J. Alpers, MD (Ref. 1); George J. Andros, MD; Fred Burg, MD; paul C. Brucker, MD; Edward Coppola, MD (Ref. 1); John J. Dowling, MD; Thomas Duane, MD; Emmet Ferguson, Jr, MD; William Fifer, MD; Paul J. Fink, MD; Carla E. Goepp, MD; Michael Goran, MD; William Holden, MD; Edsel Hudson, MD; George Jackson, MD; William F. Kellow, MD (Ref. 1); Mark H. Lepper, MD; Edward H. McGehee, MD; Andrew Saladino, MD; Jussi J. Saukkonen, MD; Osamu Yamada, MD; and Carter Zeleznik, PhD. (Ref. 1) Deceased. We would also like to thank the medical records technicians who participated in the development of the coded criteria. The following SystemMetrics staff members have also been instrumental in the development of staging: John J. McCord, Anthony J. Pepitone,Craig S. Spirka, Cathleen A. Barnes, Jeanie L. Westnedge, Katherine M. Sredl, and Nancy Jordan.

ABSTRACT: Measurement of illness severity is required to evaluate diagnostic efficiency of physicians, assess quality of care, understand utilization of health services, design clinical trials, and reimburse hospitals on the basis of output. "Staging" is a method for measuring severity of specific, well-defined diseases. Staging defines discrete points in the course of individual diseases that are clinically detectable, reflect severity in terms of risk of death or residual impairment, and posses clinical significance for prognosis and choice of therapeutic modality. Medical staging criteria have been developed for 420 diagnoses and converted into "coded" criteria for the major diagnostic coding systems. Coded criteria can be efficiently applied to computerized hospital discharge abstracts to derive a comprehensive case-mix classification system. Uses of staging in epidemiologic, case-mix, and utilization analyses are illustrated for diabetes mellitus. (JAMA 1984;251:637-644)

DEVELOPMENT of scales measuring severity of diseases is a major challenge for the medical profession. Severity is defined here as the likelihood of death or residual impairment as the result of a disease, without consideration of treatment. Severity scales are useful in evaluating diagnostic efficiency of physicians, refining measures of prognosis, therapeutic effectiveness, and utilization of health care services, designing clinical trials, and developing systems for reimbursing hospitals based on the diagnoses of their patients' conditions. In the area of health care evaluation, severity scales enable more accurate measurement of health status before, during, and after medical intervention and comparisons among physicians, hospitals, and health insurance programs as to the types of patients being treated. (Ref. 1) This latter point has particular relevance in light of recent changes in the Medicare program.

With the enactment of the Social Security Amendments of 1983, the Medicare program shortly will begin to reimburse hospitals on the basis of a fixed fee per case type. (Ref. 2) Regardless of the actual costs incurred in treating a given patient, within predetermined limits, the hospital will be paid a fixed amount. The system for classifying patients into payment categories is called Diagnosis Related Groups (DRGs). The DRGs were developed by researchers at Yale University under support from the Health Care Financing Administration. (Ref. 3-4) The DRGs classify patients into 470 categories based on principal diagnosis, principal surgical procedure, age, comorbidities, complications, and a few other factors. These categories were defined so as to group patients whose lengths of stay and

total charges are expected to be similar. However, there is no explicitmechanism in the DRGs to account for severity of illness within a particular diagnosis.

Many physicians and hospital administrators fear that their institutions will be unfairly penalized under the new payment system because they believe that their patients are sicker than average and that these differences are not captured by the DRGs. This is especially the case for municipal, teaching, and large referral hospitals. Indeed, to the extent that substantial variation in severity is observed within any DRG category and to the extent that severity is correlated with resource use, hospitals face an incentive to admit only the least severe cases within that category. Should this occur, it will create widespread problems of access to inpatient care for many patients who need it most. Research is urgently needed to document the extent and nature of this potential problem by examining technically appropriate patterns of inpatient resource use by level of severity within each DRG category.

This article describes an approach to measuring disease severity, called "staging," that can be used to address this problem and many others. Disease staging criteria have been developed for manual application to medical records and for automated application to computerized hospital discharge abstract data. These severity criteria cover practically all admissions to the typical hospital so that staging represents a comprehensive case-mix classification sytem. It also provides a means of assessing appropriateness of admissions and discharges, of examining associations between medical resource use and severity of specific diseases, and of comparing hospital outputs on both a large-scale basis and a case-by-case basis. The conceptual foundation of disease staging is described in this article, as well as the methods used to develop the severity criteria. Examples of potential applications of staging are presented, focusing on one disease, diabetes mellitus, to illustrate the usefulness of this measurement tool.

ANALYTIC APPROACH%Definition of Disease

To set the context for the discussion of disease staging, it is necessary to define the term disease. A disease is a well-defined model of a process of disruption in the normal homeostasis of psychological-physiological systems. Diseases should be distinguished from health problems and conditions, which are general descriptive attributes of psychological-physiological structure and/or functioning. Unfortunately, this is not always done by physicians, hospitals, health agencies, or insurance companies.The problem is compounded by the classification systems used to store, retrieve, and analyze health data. Health problems (symptoms, physical abnormalities, and pathological manifestations) are being classified, coded, and analyzed as if they were equivalent to disease. (Ref. 1-5) As a result, analyses of hospital output may be confounded and misspecified and have erroneous conclusions.

A diagnosis should have information documenting the four elements required to define a disease: location of the problem, manifestations of the medical problem, cause of the problem, and severity of the problem. Each disease should be defined in terms of some specific organ or organ system involved. Thus, an infection is not a disease but a set of health problems. Note that the concepts of "health problem" and "disease" should be distinguished from "illness," which is defined as the actual manifestation of a disease in an individual patient. However, the focus of this article is on the concept of disease.

Every disease must specify some characteristic pathophysiological change in the organ or organ system involved. Peptic ulcer would thus be an inadequate definition. Upper gastrointestinal tract bleeding secondary to peptic ulcer provides more specific information.

An etiologic factor or set of factors causing the pathophysiological changes must be given. Neither pneumonia nor bronchial pneumonia would meet this criterion. Bacterial pneumonia would be an improvement, but optimally, the specific bacteria causing the pneumonia should be documented.Health problems such as congestive heart failure (CHF) that may result from a variety of causes would not be considered to be a disease even though CHF may be coded and may be the principal diagnosis appearing on many medical

records and discharge abstracts. The implication is that the physician did not know, even after study, or did not disclose what disease produced the CHF.

Severity of the pathophysiological changes must be given, when severity is defined as risk of death or temporary or permanent impairment. This can be done simply through specification of the stage of the disease. According to this criterion, diabetes mellitus would not be a single disease but a family of diseases that includes hyperglycemia, diabetic acidosis, diabetic retinopathy, diabetic coma, peripheral neuropathy, and azotemia secondary to renal damage. Pneumococcal pneumonia with septicemia would be considered to be a different disease (severity) than pneumococcal pneumonia complicated by either empyema or meningitis.

May diagnostic labels traditionally used by medical professionals and most diagnostic rubrics in the various coding systems (eg, International Classification of Disease: Clinical Modification, ninth revision (Ref. 6)) do not give these types of data. This may cause inaccurate evaluations of the effectiveness of medical treatment and biased analyses of hospital case mix. Patients are classified into inappropriate groups for comparison of utilization patterns, and overall severity of disease for any group of patients cannot be assessed.

Disease Staging

A method called "staging" has been developed for measuring disease severity. (Ref. 7.) The concept behind staging is borrowed from clinical medicine, specifically oncology. During the course of neoplastic diseases, there are discrete "stages" that can be defined and detected clinically, reflect the severity of the disease, and have clinical significance for prognosis and choice of therapeutic modality. This concept has now been applied to other medical and surgical problems to classify essentially all hospitalized patients.

In staging, diseases are generically divided into categories of increasing levels of severity: stage 1, conditions with no complications or problems of minimal severity; stage 2, problems limited to an organ or system, significantly increased risk of complications over stage 1; stage 3, multiple site involvement, generalized systemic involvement, poor prognosis; stage 4, death. Staging does not depend on actual utilization patterns or on expected response to therapy to assess severity. It is based on a conceptual model of the disease process itself rather than on the relative efficacy of medical technology. Note that even though disease technically ceases to exist on death of the patient, it is useful, from both heuristic and practical viewpoints, to include death as an end point of the severity scale. This provides explicit consideration of patients who die during the course of their treatments.

METHODS

Development of staging criteria for all known diseases is an exceedingly costly and probably unnecessary task. Therefore, a subset of conditions had to be identified. Two objectives governed this task: one was to include the major diseases in each etiology-body system class, the other was to cover the majority of admissions to a typical short-term general hospital. The first objective relates to the medical usefulness of the staging criteria, and the second relates to their usefulness for administrative, policy, and research purposes in hospitals. The etiology-body system matrix, as shown in the Figure, was used to classify the conditions that were important from either a medical or utilization perspective. The former was operationalized by one of the authors in consultation with medical colleagues. The latter was operationalized by analyzing diagnosis frequencies from a set of 387,000 hospital discharge abstracts. Finally, diagnostic coding manuals were inspected to ensure that omitted conditions were each potentially considered for inclusion in the list. Approximately 400 conditions were identified in this process. During the course of development of the staging criteria, other conditions were added by the physician consultants, some were redefined, and still others deleted. Finally, some "catchall" criteria sets were developed to handle residual cases when processing discharge abstracts. These steps ensured

that staging would be useful as a comprehensive case-mix classification system that could be applied to large groups of patients.

Development of Medical Staging Criteria

A panel of 23 medical consultants was formed to assist in specification of the medical staging criteria. (The panel members are listed at the end of the article.) Each disease was assigned to two members of the panel to be staged independently. The specific instructions to the panel called for every condition to be divided into at least four primary stage categories, according to the generic definitions specified previously. The panelists were encouraged to develop as many substages within each primary category as deemed appropriate. Each substage should place the patient at a significantly higher risk of morbidity or mortality or both than the previous substage and should be clinically differentiable from other substages. When complications with each primary stage or substage cannot be differentiated in their severity, they should be classified as equivalent. Only single disease entities, without concern for complications arising from a simultaneous, unrelated condition (eg, skin infection in a patient with hypertension, or age of the patient), should be considered. Finally, stages of disease should be defined primarily in terms of biologic complications.

The panelists were instructed as to the importance of specifying synonyms, so that the criteria could be made as general as possible for use with coded diagnostic data to capture all patients who may have the condition regardless of variations in use of medical terminology by physicians, nurses, and medical records technicians.

Finally, the panelists were asked to furnish criteria for objectively validating the presence of the stage in the patient, either quantitatively or qualitatively, and to provide a list of references to support the medical judgments implicit and explicit in the criteria.

Development of Coded Staging Criteria

The medical medical criteria can be applied on a manual basis to medical records to analyze patients within an institution or a selected disease category. While this requires only a few minutes per patient, which may be acceptable for physicians in recording diagnoses on patients' charts, it may be too time-consuming and costly for retrospective use in large-scale research projects and utilization reviews. A computerized version of staging is required to facilitate historical analyses of large numbers of hospitalized patients.

To accomplish this goal, a team of medical records technicians was employed to translate each stage and substage definition into diagnostic codes, using the three primary disease classification systems: ICDA-8, (Ref. 8) H-ICDA-2, (Ref. 9) and ICD-9-CM. (Ref. 6) Operationally, a procedure similar to that used for medical criteria development was used for the coding process. Each medical staging criteria set was coded independently and then reviewed by a third medical records technician to resolve discrepancies. When necessary, physician panel members were consulted to assist in the final decision making.

Two types of problems had to be addressed in translating the medical criteria into coded criteria: lack of specificity in the coding systems themselves and lack of availability of certain data items on a typical discharge abstract. In terms of lack of code specificity, the problem is that coding systems do not always allow for the precision specified by the medical staging criteria. For example, the medical criteria for appendicitis classify localized peritonitis as stage 2.1 and diffuse peritonitis as stage 2.2. However, it is not possible to differentiate between localized and diffuse peritonitis in the ICDA-8 or H-ICDA-2 coding systems.This problem was resolved via a conservative strategy to understate stage of disease; ie, a patient with only the diagnostic codes for appendicitis and peritonitis would be classified as stage 2, since there is no way of knowing whether the peritonitis is localized or diffuse. Of course, if this patient had other complications of appendicitis, such as septicemia, then he or she is classified as stage 3.

The other area in which changes to the medical criteria were necessary

relates to the lack of data (primarily physical findings and laboratory and roentgenographic study results) in most discharge abstract data systems. It is not possible to specify a stage (or a substage) that is defined solely on laboratory results by use of discharge abstract data. For example, the stages of aplastic anemia are defined in terms of hemoglobin levels and white blood cell and platelet counts. Again, the coded criteria tend to understate the severity of the disease in this situation.

An example set of medical and coded staging criteria for diabetes mellitus is presented in Table 1. Diabetes was one of the more difficult diseases to stage because its manifestations range from mild to severe metabolic derangement, which are potentially reversible, and these may be superimposed on permanent dysfunction of other organs.

Note: This table may be divided, and additional information on a particular entry may appear on more than one screen

Table 1. -- Medical and Coded Criteria for Disease Staging

Diagnosis: Diabetes Mellitus; Etiology: Metabolic

Stage	Common Description or Name of Condition	Alternate Description or Synonym
1.0	Diabetes mellitus	Hyperglycemia, "sugar diabetes"
2.1	Diabetes mellitus with an infection in one or more systems (eg, skin, genital tract, urinary tract)	Diabetes mellitus with complications of infectious nature: pyoderma, impetigo, furunculosis, monilial vulvitis, monilial skin infection, cystitis, urethritis, epididymitis, prostatitis, pyelonephritis
2.2	Diabetes mellitus with Septicemia	Diabetes mellitus, infection, and associated toxins of bacteria in bloodstream
2.3	Diabetes mellitus with acidosis	Diabetic acidosis or ketosis Diabetes with ketonemia or ketonuria
2.4	Diabetes mellitus with retinopathy but without loss of vision, or glomerulosclerosis (without azotemia), or neuropathy (peripheral or autonomic), or gangrene (tissue breakdown)	Microangiopathy Kimmelsteil-Wilson disease Arterial insufficiency with associated tissue breakdown
3.1	Diabetes mellitus with acidosis and coma, or retinopathy and loss of vision, or necrotizing papillitis, or azotemia	Diabetic coma with ketosis or acidosis Proliferative retinopathy Papillary necrosis, medullary necrosis
3.2	Diabetes mellitus with hyperosmolar coma	Nonketotic, hyperosmolar hyperglycemic coma
3.3	Shock	
4.0	Death	

Diagnosis: Diabetes Mellitus; Etiology: Metabolic

Stages	IDC-9-CM Codes That Define Each Stage and Substage
1.0	775.10, 790.20, 250.00-250.01, 250.80-250.91
2.1	Stage 1.0+320.00-342.90, 245.00-245.10, 254.10, 289.20-289.30, 420.00-422.99, 424.91, 429.89, 447.60, 480.00-486.00,

510.00-510.90, 511.10, 513.00-
513.10, 526.40, 566.00-567.90,
569.50, 572.00, 577.00,
580.81, 590.00-590.30, 595.00-
595.40, 595.89-595.90, 597.00-
597.80, 598.00-598.01, 599.00,
601.00-601.90, 603.10, 604.00-
604.99, 607.10-607.20, 590.90,
608. 00, 608.40-608.81, 611.00,
614.00-616.11, 616.30-617.90,
680.00-686.90,711.00-711.99,
728. 00,730.00-730.39, 730.80-
730.99

2.2 Stage 1.0+038.00-038.90

2.3 Stage 1. 0+588.80, 791.60,
276.20-276.40;
250.10-250.11

2.4 Stages 1.0-2.3+337.10, 362.18,
443.81, 443.90, 446.60,
447.10, 581.81, 785.40,
354.00-356.90;
357. 20, 362.01,
250.40-250.74

3.1 Stage 2.4+276.20, 369.00-
369.90; Stages 1. 0-2.4+583.70,
780.00, 790.60, 584.50-586.00,
590.80-590.81; 362.02, 250.30-
250.31

3.2 250.20-250.21

3.3 Stages 1.0-3.2+458.00, 458.90,
%?785.50-785.59, 788.50, 994.00,
994.80, 995.00, 995.40,
958.40, 998.00, 999.40,
669.10-669.14, 639.50

4.0 Stages 2.2-3.3 + Death

Computer Software System

A computer software system has been developed to employ staging on large-scale data bases. An individual patient record from a computerized discharge abstract file is read by the program and systematically searched for the principal and associated diagnoses. If one of the conditions for which staging criteria exist appears among this vector of diagnostic codes, the patient is "staged" for that condition. For each such medical (or surgical) problem, patients are assigned the highest stage specifically justified when all of the diagnostic vector is taken into account; ie, the patient is staged for each diagnosis listed, given the other diagnoses listed.

This software will classify patients into any of 420 diagnostic categories and assign an ordinal stage within each category. In addition to diagnostic data, the software also employs data on selected procedures, sex, and whether or not the patient was alive at time of discharge.

Other than principal diagnosis, the staging software does not require any ordering of the diagnosis vector. Moreover, the software will overrule the principal diagnosis listed if it is a complication or manifestation of a secondary diagnosis, according to the medical criteria. For example, neuropathy is considered a manifestation of diabetes mellitus by the software when both conditions are listed on a discharge abstract, regardless of the order in which they appear.

APPLICATIONS

Staging can be done manually from medical records. Experienced medical records technicians can easily and reliably assign stage of disease from a full medical chart. Staging from the record gives more valid results than from the abstract or face sheet because of the greater amounts of data available.

Staging has been used in a number of studies to evaluate helath care quality and costs. (Ref. 10-11) It provides a useful framework for organizing clinical data on the patient for purposes of analysis of utilization patterns. A complete report on the development of the medical and coded staging criteria, together with the staging software, is now available to assist in development of new applications of staging. (Ref. 12)

One purpose of this article is to illustrate the uses of staging by means of three examples: epidemiologic, case-mix, and utilization analyses. Staging is a tool that can be used to address such questions as: Who tends to have more severe cases of a given disease? Which providers tend to treat more severe cases of a disease on average? How does utilization of health services vary with disease severity?

Data

The data for the empirical analysis presented herein were derived from discharge abstracts of 373 short-term general non-federal hospitals that are participating in the Hospital Cost and Utilization Project (HCUP) being conducted by the National Center for Health Services Research. (Ref. 13)

Hospital Sample. -- Hospitals were chosen with controlled selection sampling from a unverse that met minimum requirements related to data availability, quality, and continuity. An initial sample of 764 hospitals was drawn, of which 384 agreed to participate in the study and 373 provided discharge data for 1977. Comparison of the characteristics of the original sample with the final sample reveals a high degree of similarity. The final sample includes 65 proprietary hospitals and 71 public general hospitals; 138 hospitals are located in rural areas, and 130 have less than 100 beds, while 103 have 400 beds or more. Hospitals with less than 25 beds were not included in the original sample.

Patient Sample. -- The volume of patient records contained in the discharge abstract files of 373 hospitals necessitated development of a sampling strategy for measurement of hospital use and case mix. A stratified random sample of abstracts was drawn from each of the participating hospitals for the calendar year 1977. The stratification variables were race (white or nonwhite), expected source of payment (Blue Cross, Medicare, Medicaid, commercial, self-pay, or other), single-multiple diagnosis, and time of year of discharge (first or second six months).

The total number of cases in patient sample is 392,456, with a range of 80 to 3,638 cases per hospital and a mean of 1,052 cases per hospital. Of these, only 275 cases did not contain sufficient data to be "staged" by the software, providing a total sample of 392,181 "staged" records.

Other Data Sources. -- Data on hospital characteristics, eg, size, teaching status, and location, were obtained from the 1977 Annual Survey of Hospitals conducted by the American Hospital Association.

Results

Diabetes mellitus was one of the ten highest-frequency conditions in the patient sample, with 1.5% of discharges, or 5,842 patients having this as their primary staged diagnosis. Almost half of these patients did not have any further complications related to diabetes listed on the abstract, so that they were classified as stage 1. On the other hand, the inpatient case fatality rate for this disease was 202 deaths per 10,000 cases. Almost 20% of diabetes cases were admitted with an infection in one or more of the body systems listed as a major complication of the disease, while almost 10% were admitted with acidosis as the major complication. Combinations of retinopathy, glomerulosclerosis, neuropathy, gangrene, necrotizing papillitis, and azotemia (with or without acidosis and coma) accounted for almost 20% of the cases.

In the tables, the substages under stages 2 and 3 are combined so as to simplify presentation and obtain higher frequencies in each severity level to facilitate further breakdowns by patient and hospital characteristics. Chi-square tests were performed to test for presence of systematic associations between stage and patient and hospital characteristics. All of the results of these tests proved to be significant at the P =.05 level and below.

Epidemiologic Analysis. -- One question of interest can be addressed

with the staging criteria and software: who are the patients who tend to have more severe cases of a particular disease? In Table 2, stage distributions for diabetes by selected patient attributes are presented. One immediately remarkable finding is a strong association between stage and age. Older persons tend to have relatively more several cases of this disease.

Note: This table may be divided, and additional information on a particular entry may appear on more than one screen

Table 2. -- Distribution and Length of Stay (LOS) of Diabetes Mellitus Cases, by Stage of Disease and Selected Patient Characteristics, 1977 R1

Patient Characteristics	Stage 1 No.	Stage 1 %LOS, Days	Stage 2 No.	Stage 2 %LOS, Days
All patients	2,914	49.9 R2 9.17	2,330	39.9 R3 11.67
Age, yr				
0-19	189	50.5 R2 6.15	176	47.1 R3 5.70
20-44 R4	510	49.3 7.19	442	42.7 8.65
45-64	1,109	51.8 R3 8.88	826	38.6 R3 11.79
65-79	870	48.8 R3 10.54	687	38.5 R3 13.85
>=80	236	46.4 R3 12.21	199	39.1 R3 15.89
Type of admission				
Emergency R4	417	42.5 10.39	423	43.1 12. 97
Regular	2,497	51.4 R3 8.97	1,907	39.2 R3 11.36
Surgical status				
Operated on R4	283	25.8 8.38	671	61.1 9.79
Not operated on	2,631	55.5 R3 16.64	1,659	35.0 R3 16.27
Source of payment				
Blue Cross R4	598	52.0 8.47	462	41.1 10.51
Medicare	1,212	47.9 R3 10.75	975	38.5 R3 14.02
Medicaid	299	51.1 8.28	232	39.7 10.25
Commercial	549	55.0 R3 7.50	394	39.5 R3 8.95
Self-pay	108	38.9 R3 6.80	141	50.7 10.90
Other	148	49.5 8.91	126	42.1 9.53

Patient Characteristics	Stage 3 No.	Stage 3 %LOS, Days	Stage 4 No.	Stage 4 %LOS, Days
All patients	480	8.2R3 11.94	118	2.0R3 12.84
Age, ye				
0-19	8	2.1 8.37	1	0.3 4.00
20-44 R4	77	7.4 9.06	6	0.6 7.33
45-64	171	8.0R3 11.31	34	1.6 11.88
65-79	174	9.8R3 14.07	53	3.0 14.42
>=80	50	9.8R3 11.93	24	4.7 12.54
Type of admission				
Emergency R4	103	10.5 12.29	38	3.9R4 10.40
Regular	377	7.8R3 11.86	80	1.7R3 14.03
Surgical status				
Operated on R4	115	10.5 11.58	30	2.7 8.55
Not operated on	365	7.7 13.10	88	1.9R3 25.30
Source of payment				
Blue Cross R4	79	6.9 10.67	12	1.0 11.15
Medicare	267	10.6 12.62	77	3.0 14.73
Medicaid	48	8.2 13.23	6	1.0 2.50
Commercial	45	4.5 8.20	10	1.0 15.20
Self-pay	20	7.2 14.65	9	3.2 6.33
Other	21	7.0 10.93	4	1.3 4.66

Patient Characteristics	All Patients No.	All Patients %LOS, Days
All patients	5,842	100 10.47
Age, yr		
0-19	379	100 R3 5.97
20-44 R4	1,035	100 7.96
45-64	2, 140	100 R3 10.24
65-79	1,784	100 12.26

>=80	509	100		13.63
Type of admission				
Emergency R4	981	100		11.71
Regular	4,861	100	R3	10.22
Surgical status				
Operated on R4	1,099	100		9.12
Not operated on	4,743	100	R3	16. 29
Source of Payment				
Blue Cross R4	1,151	100		9.48
Medicare	2,531	100	R3	12.33
Medicaid	585	100		9.42
Commercial	998	100	R3	8.19
Self-pay	278	100		9.43
Other	299	100		9.27

(Ref. 1) Source: National Center for Health Serivces Research, Hospital Cost and Utilization Project.

(Ref. 2) LOS is significantly different from LOS FOR REFERENCE GROUP AT P<.05 level.

(Ref. 3) LOS is significantly different from LOS for reference group at P<.01 level.

(Ref. 4) Reference group for significance tests of differences between means.

Patients listed as emergency admissions on the discharge abstract are more likely to have higher severity and die than regular admissions, thus providing a validity check on the staging criteria.

Fewer than one fifth of diabetes cases are operated on, but they have substantially higher severity levels, indicating an association between severity and resource use. This is also supported by a strong association between stage and number of procedures listed on the abstract.

Finally, Medicare and self-paying patients are revealed to have significantly higher severity levels than other groups of patients. In the case of Medicare, this is likely to be age related. However, the higher severity of self-pay patients may be related to delay in seeking appropriate care, so that the disease progresses to a more advanced stage before care is initiated. This would be an example of where stage profiles can highlight potential problems in the provision of ambulatory care.

Case-Mix Analysis. -- A second application of staging is measurement of severity of hospitals' case mixes. By case mix, we mean the variety of different diseases being treated by the hospital. Following the definition of disease specified earlier, each stage of a disease constitutes a different disease that should be reflected in the case-mix measure. In this empirical example, the mix of case types within diabetes mellitus are examined. Staging can also be applied as a comprehensive case-mix measure for the entire hospital because the criteria cover almost all patients admitted to a typical hospital.

Staging profiles for diabetes mellitus by selected hospital characteristics are presented in Table 3. Again, some interesting associations with severity are found. Proprietary hospitals are shown to admit less severely ill diabetic patients as compared with voluntary and governmental hospitals. Strong associations between bed size and severity are observed.Medical school-affiliated hospitals tend to admit relatively more severe cases than nonaffiliated hospitals.

Note: This table may be divided, and additional information on a particular entry may appear on more than one screen

Table 3. -- Distribution and Length of Stay (LOS) of Diabetes Mellitus Cases, by Stage of Disease and Selected Hospital Characteristics, 1977 R1

	Stage 1			Stage 2		
Hospital Characteristics	No.	%LOS, Days		No.	%LOS, Days	
All patients	2,879	49.8	R2	9.172,309	40.0	R3 11.67
Ownership						
Proprietary R2	307	54.2		8.32 201	35.5	10.72
Voluntary	2,153	50.2	R3	9.521,709	39.9	11.89
State-local government	403	45.5		7.96 381	43.1	11.22

No. of Beds							
25-99 R2	60053.9		7.65	41337.1		10.49
100-299	65752.4	R4	8.40	48438.6		10.61
300-499	93548.7	R3	9.89	79141.2	R3	12.21
>=500	68746.1	R3	10.24	62141.7	R3	12.58
Teaching status						
Not affiliated with medical school R2	1,59055.1		8.84	1,04136.1		11.58
Affiliated with medical school	1,27344.6	R3	9.59	1,25043.8		11.74

	Stage 3			Stage 4		
Hospital Characteristics	No.	%LOS, Days		No.	%LOS, Days	
All patients	472	8.2	R3 11.94	1172.0	R3	12.84
Ownership						
Proprietary R2	49	8.7	10.94	91.6		11.44
Voluntary	337	7.9	11.97	902.1		12.92
State-local government	83	9.4	12.46	182.0		13.16
No. of Beds						
25-99 R2	86	7.7	11.66	141.3		9.29
100-299	87	6.9	R3 8.46	252.0		16.00
300-499	150	7.8	13.37	462.4		11.90
>=500	149	10.0	12.70	322.2		13.32
Teaching status						
Not affiliated with medical school R2	208	7.2	10.96	451.6		10.02
Affiliated with medical school	261	9.1 R4	12.74	722.5		14.60

	All Patients		
Hospital Characteristics	No.	%LOS, Days	
All patients	5,777	100	10.47
Ownership			
Proprietary R2	566	100	9.45
Voluntary	4,289	100	R3 10.73
State-local government	885	100	9.89
No. of Beds			
25-99 R2	1,113	100	9.02
100-299	1,253	100	9.41
300-499	1,922	100	R3 11.16
>=500	1,489	100	R3 11.53
Teaching status			
No affiliated with medical school R2	2,884	100	10.01
Affiliated with medical school	2,856	100	R3 10.95

(Ref. 1) Totals within this Table may vary because of missing data. Total number of cases in Table 3 is less than Table 2 because 1% of the hospitals were randomly dropped when merging hospital characteristics to provide additional protection for institutional identities. Source: National Center for Health Services Research, Hospital Cost and Utilization Project.

(Ref. 2) Reference group for significance tests of differences between means.

(Ref. 3) LOS is significantly different from LOS for reference group at P<.01 level.

(Ref. 4) LOS is significantly different from LOS for Reference group at P< .05 level.

It is not appropriate to interpret these simple associations as causation. There are any number of potentially confounding factors. For example, proprietary hospitals in this sample tend to have fewer beds and to be located in the South and West, so that size and region are associated with ownership. Also, larger hospitals tend to have a higher likelihood of

medical school affiliation. These simple tabulations do serve, however, to illustrate that there are significant case-mix differences among hospitals with respect to severity for this diagnosis.

Utilization Analysis. -- An important hypothesis regarding hospital utilization is that sicker patients require more care. Staging enables a direct test of this hypothesis. Tables 2 and 3 also show how length of hospital stay varies with selected patient and hospital characteristics within each stage. This enables the dimension of severity to be held constant while the impact of other factors on length of stay is examined. Within each stage, t tests were performed to test for significant differences in lengths of stay by patient and hospital characteristics. A single group was selected for comparison purposes in the case of variables with multiple classifications, such as age and source of payment.

Table 2 presents average length of stay breakdowns by stage and patient characteristics for diabetes mellitus.The first finding of interest is that length of stay increases with stage for this disease, ranging from 9.17 days for stage 1 to 12.84 days for stage 4. The second finding of critical interest is that length of stay increases with age within stage, except for patients who die, where no statistically significant differences are found (in comparison with the 20- to 44-year-old age group).

Emergency admissions have longer stays for stages 1 and 2 than regular admissions. Surgical cases have considerably longer stays than nonsurgical cases of this disease for stages 1, 2, and 4. In the case of patients who die in the hospital, those who are operated on have almost three times the length of stay of those who are not.

Length of stay breakdowns by source of payment for each stage of diabetes reveal associations with age, with Medicare patients having the longest stays and type of coverage, with commercial and self-pay patients having significantly shorter stays than Blue Cross patients for less severe stages of the disease. No significant differences in stays across pay sources are observed for stages 3 and 4, which suggests that length of stay becomes more variable with increased severity and also that economic factors may not be relevant at higher severity levels.

Length of stay breakdowns for diabetes by selected hospital characteristics are presented in Table 3. Patients in voluntary hospitals are shown to have slightly longer stays for stage 1 than those in proprietary and state or local government hospitals. No differences by ownership are observed for stages 2, 3, or 4. Patients in larger hospitals have longer stays than those in smaller hospitals for stages 2 and 3. The variability in length of stay for stages 3 and 4 precludes detection of any significant stay differences by ownership. Length of stay is associated with teaching activities for stages 1, 3, and 4. Patients in hospitals affiliated with a medical school tend to stay from three fourths to more than 4 1/2 days longer, on average, with the differential increasing with stage. Not shown here is that regional differences in length of stay are found for all stages except death. Patients in Northeastern hospitals tend to stay longer than patients in all other regions of the country, and those in Western hospitals tend to stay less time than all others. These findings are consistent with results for other samples. (Ref. 14-15)

COMMENT

A critical issue facing health care professionals is the development of techniques for measuring hospital output. Different diseases require different treatment modalities, including different types and magnitudes of professional and institutional resources to achieve desired outcomes. Methods must be developed that can be used to categorize patients in such a way that homogeneity within groups and heterogeneity between patient groups, with respect to the nature of their illnesses, are maximized. Such a classification scheme, which must allow for the assessment of severity of disease, can then be used for studies of hospital utilization and costs, development of equitable reimbursement mechanisms for hospitals, certification of institutions and providers for the treatment of different patient groups, and design of clinical trials to test the efficacy of different treatment modalities.The analysis presented herein reveals that diabetes is actually several diseases with differing patterns of care with

respect to length of stay, surgery, and overall service intensity.The association between severity and resource use provides predictive validity of the staging criteria.

Considerable within-stage variation in resource use remains, much of which may be cause by factors other than biologic severity of illness. Patient-related factors, such as age, income level, expectations, health insurance coverage, family support, and presence of unrelated comorbidities; provider-related factors, such as specialty, degree of specialization, and choice of treatment modality; institutional factors, such as availability of special care units and extent of teaching activities; and community factors, such as supply of hospital beds, all can have significant impacts on cost and quality of care that should be considered along with stage of disease when analyzing these issues. (Ref. 16-17).

Inaccuracies in recording and coding of diagnostic data on hospital discharge abstracts also may contribute to observed variation in resource use within stage of disease. Results of analyses of historical data files must be interpreted with caution because high within-stage variation in actual severity levels may be present.

staging is relevant to the individual physician because it provides a tool for sharpening diagnostic classification. This will become particularly relevant in dealing with the impending regulations governing hospital admissions and discharges under the new DRG program for Medicare. As a consequence of the incentives in the DRG reimbursement system, new regulations governing use of the hospital are being developed. One outcome of this process will be greater requirements for documenting and justifying hospital admissions and discharges. Severity will play a crucial role here and staging can be used as an operational measure.

In contrast to other existing casetype classification system such as the DRGs, an important characteristic of the staging criteria is their emphasis on medical meaningfulness. (Ref. 18) Moreover, no utilization data are used to develop or operationalize the staging criteria. The DRGs use principal operating room procedures to classify patients in different groups and ignore etiology and severity of the problem. For example, patients receiving a coronary bypass procedure are classified differently than those with the same principal diagnosis but who received a nonsurgical therapeutic regimen. Diagnosis Related Groups are focused on what was actually done for the patient rather than on the nature of his disease. As a result, DRG No. 1 classifies patients on the bais of performance of a craniotomy and ignores whether patients have abscesses, aneurysms, or tumors. Comparisons between physicians and hospitals on patters of resource use in this DRG are likely to be misleading. Staging has an underlying a priori theoretical structure in which only clinically pertinent attributes of the patient are employed. This enables comparison and evaluation of surgery rates for a given stage of a disease across institutions and physicians. Perhaps more important is that staging enables incorporation of disease severity into the prospective payment system.

CONCLUSIONS

The utility of the coded staging criteria and the staging software has been demonstrated by the analyses of diabetes mellitus presented previously. Significant differences in stage profiles across selected patient and hospital characteristics were high-lighted. These can be used for purposes of conducting evaluations of quality of care in ambulatory care sytems and of appropriateness of admissions and discharges in hospitals.The latter point is particularly relevant under the new DRG payment system in which hospitals face incentives to maximize the number of "profitable" patients. Staging can be used to conduct assessments of the social epidemiology of disease and is also useful for analysis of inpatient resource intensity. Patient and hospital characteristics were shown to be significantly associated with length of stay within each stage of diabetes. While the purpose of this article is not to study diabetes per se, the analysis demonstrates the appropriateness of a disease-specific approach to utilization research.

Disease stabing does not attempt to capture all of the variables that

may contribute to hospital costs or resource requirements. Indeed, it is specifically focused only on one -- severity of disease. Thus, staging should not be asked to provide a complete explanation of variation in hospital resource intensity. Staging does provide the framework to ask what resources are necessary to respond to differences in the nature of the patient's disease.

Future work should focus on improving diagnostic coding systems and quality of discharge abstract data as well as on applying staging to medical records at different points during the hospitalization. Data should be analyzed at three crucial points: at admission, during the hospital stay (eg, the immediate postoperative period), and at time of discharge. This is required to document complications present when the patient was first seen, those developing during the hospitalization, and those successfully treated. Only by evaluating severity of patients' illnesses at various times can meaningful analyses of quality and cost-benefit tradeoffs be made.

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     $0.22 Estimated cost File431
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              $4.45  1 Type(s) in Format  9
          $46.25  20 Types
    $49.81 Estimated cost File442
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     $0.21 Estimated cost File77
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     $0.38 Estimated cost File266
           $3.41    0.710 DialUnits File444
              $8.80  4 Type(s) in Format  3
           $8.80  4 Types
    $12.21 Estimated cost File444
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     $2.40 INTERNET
    $65.95 Estimated cost this search
    $66.07 Estimated total session cost   2.337 DialUnits
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